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(54) Title: CLEAR COAT BATTER FOR FRENCH FRIED POTATO STRIPS

(57) Abstract

An improved clear coat batter is provided for use with French fried potato strips, to produce parfried and frozen French fry strips which can be finish prepared with improved crispness and with reduced toughness and reduced off flavors. The batter generally comprises an aqueous slurry including by weight about 3 % potato starches, about 11 % tapioca starch, about 14 % corn starches, about 8 % rice flour, and about 3 % dextrins. French fry strips are coated with the batter following an initial blanching step, after which the strips are parfried in hot oil and then frozen. Upon subsequent finish preparation such as by finish frying in hot oil, the coated French fry strips exhibit improved surface crispness over a typical holding time of about four to ten minutes before serving. In addition, the finished strips are less tough and have improved flavor characteristics.

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CLEAR COAT BATTER
FOR FRENCH FRIED POTATO STRIPS

BACKGROUND OF THE INVENTION

This invention relates generally to improved batter coated French fry potato strips and related processes for preparing such strips by parfrying and freezing to enable subsequent finish preparation in a relatively short cycle time. More specifically, this invention relates to an improved and relatively economical clear coat batter for coating French fry strips prior to parfrying, to yield finish prepared strips with improved crispness, toughness and flavor characteristics.

Parfried and frozen potato strips, commonly referred to as French fries, are widely available in the foods industry. These potato products are conventionally prepared by cutting whole potatoes into elongated strips of a desired size and shape, and then partially cooking the potato strips by blanching in water or steam. Thereafter, the potato strips are partially fried, or parfried, in hot cooking oil followed by freezing for packaging, shipping and/or storage. Prior to consumption, the parfried and frozen potato strips are reconstituted or finish prepared typically by finish frying in hot oil. French fried potato strips of this type are utilized extensively in restaurant and food service operations, and particularly in so-called fast food restaurants wherein it is desirable to produce a finish cooked product with a substantially optimized set of quality characteristics and with a finish preparation time that is as short or fast as possible.

More specifically, one major objective of potato processors is to provide parfried and frozen potato strips which can be finish prepared with a combination of taste, color, odor, and textural attributes selected for optimum consumer palatability. For example, it is highly desirable to provide parfried and frozen potato strips which, after reconstitution, exhibit a light and tender but crispy and golden brown exterior surface encasing a soft and mealy interior which is neither too dry nor too soggy. Moreover, especially in a fast food restaurant environment, it is important to provide finish cooked potato strips which can consistently retain these desired sensory qualities for an extended holding period of at least several minutes before actual

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consumption. In the past, achieving these desirable product qualities on a consistent basis has generally required that the potato strips be finish prepared by frying in hot oil. In a fast food establishment, to avoid advance preparation of potato strips that might not be sold or served within a limited holding time of several minutes, a rapid finish fry step is desired and is typically on the order of about 1 - 3.25 minutes for smaller so-called shoestring size cut strips and about 3 - 4 minutes for larger strip cut sizes.

In recent years, alternative finish preparation methods have been researched in an attempt to eliminate the need to finish fry potato strips at the restaurant or food service facility. In this regard, traditional finish fry preparation methods have required specialized or dedicated frying equipment which can be difficult to maintain in a clean and sanitary condition. Moreover, finish frying steps inherently require the facility to use and handle significant amounts of cooking oil, with its associated cost and increasingly complex issues of used oil disposal. Further, there is an increased demand among health conscious consumers for food products having a reduced oil or fat content, whereby there is a growing demand for potato strips which are not finish prepared by frying. While these factors all contribute to an increasing interest in potato strips which have been finish prepared by means other than frying, the final product served to the consumer must exhibit a substantially optimized set of taste, appearance and textural characteristics similar to a finish fried product in order to achieve consumer acceptance.

Moreover, in recent years, batter coatings in the form of a water-based starch slurry have been proposed in French fry potato strip preparation processes, wherein the potato strips are dipped into or sprayed with the coating before parfrying and freezing. See, for example, U.S. Patents 5,059,435; 5,141,759; 5,648,110; and 5,750,168. Such batter coated potato strips are subsequently finish prepared normally by finish frying in hot oil, to produce potato strips having enhanced external crispiness and exhibiting somewhat extended product holding times prior to consumption. Prior attempts to finish prepare such batter coated products by other methods, particularly such as by oven heating with a fast cycle time comparable to finish frying, have generally resulted in potato strips which are unacceptably limp and soggy, and which do

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not exhibit a satisfactory post-preparation holding time. One improved process for preparing batter coated strips suitable for fast cycle finish preparation in an oven is disclosed in copending U.S. Serial No. 09/182,618, which is incorporated by reference herein. Such batter coatings, however, sometimes contribute to increased toughness in the finish prepared strips, and may also contribute to various off flavors associated with ingredients used in the batter coating. Moreover, batter coatings undesirably increase the overall production costs for the French fry strips, both in terms of the cost of the coating ingredients and the inclusion of additional processing steps to prepare and apply the coating to the strips prior to parfrying.

The present invention relates specifically to an improved and relatively economical batter coating for application to French fry potato strips and the like, wherein the improved batter coating results in French fry potato strips which can be finish prepared by frying or by other methods such as oven heating with a highly desirable and acceptable combination of taste, appearance and texture characteristics including improved crispness, reduced toughness, and little or no off flavor.

SUMMARY OF THE INVENTION

In accordance with the invention, an improved clear coat batter is provided for use with French fried potato strips, to produce parfried and frozen French fry strips which can be finish prepared with improved crispness and with reduced toughness and reduced off flavors. The improved batter coating comprises a relatively economical combination of ingredients and permits the finish preparation of coated potato strips by finish frying or by other methods such as oven heating, wherein the finish prepared potato strips are characterized by enhanced outer surface crispness for maintaining quality characteristics for an extended post-preparation holding time, together with reduced overall toughness and little or no off flavor.

In one preferred form of the invention, the improved batter generally comprises in dry form by weight about 1 - 12% and preferably about 6% potato starch, about 20 - 30% and preferably about 27% tapioca starch, about 20 -

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40% and preferably about 30% modified and unmodified corn starch, about 15 - 25% and preferably about 20% rice flour, and about 4 - 12% and preferably about 8% dextrins which may comprises potato dextrin or a combination of potato and tapioca dextrins. These ingredients are mixed in an aqueous slurry with a solids proportion of about 38 - 44% and preferably about 41 - 42% by weight, wherein the resultant slurry includes by weight about 3% potato starches, about 11% tapioca starch, about 14% corn starches, about 8% rice flour, and about 3% dextrins.

French fry strips are coated with the batter following an initial blanching step, after which the strips are parfried in hot oil and then frozen. A second parfry step and final freezing step may be optionally employed. Thereafter, the batter coated and frozen strips can be finish prepared such as by finish frying in hot oil. The finish prepared and batter coated French fry strips exhibit improved surface crispness over a typical holding time of about four to ten minutes before serving. In addition, the finished strips are less tough and have improved flavor characteristics.

Other features and advantages of the invention will be more apparent in view of the following detailed description.

DETAILED DESCRIPTION OF THE INVENTION

An improved starch-based batter is provided for coating cut vegetable strips particularly such as French fry potato strips and the like preparatory to parfrying and freezing. The improved batter coating comprises a relatively economical combination of ingredients and permits the finish preparation of coated potato strips by finish frying or by other methods such as oven heating, wherein the finish prepared potato strips exhibit a desirable and high quality set of taste, appearance and texture characteristics. Importantly, the finish prepared strips are characterized by enhanced outer surface crispness for maintaining quality characteristics for an extended post-preparation holding time, together with reduced overall toughness and little or no off flavor.

In general, the batter coating comprises an aqueous slurry applied to cut potato strips following a preliminary blanching step and preceding the steps of parfrying and freezing the potato strips. The batter coating in dry form

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generally comprises by weight 1 - 12% and preferably about 6% potato starches, about 20 - 30% and preferably about 27% tapioca starch, about 15 - 25% and preferably about 20% modified corn starch, about 5 - 15% and preferably about 12% unmodified corn starch, about 15 - 25% and preferably about 20% rice flour, and about 4 - 12% and preferably about 8% dextrins. When prepared in slurry form, with the dry ingredients representing about 38 - 44% by weight, the batter in the preferred form comprises by weight about 3% potato starches, about 11% tapioca starch, about 14% modified and unmodified corn starches, about 8% rice flour, and about 3% dextrins. The potato strips are dipped into or sprayed with the batter coating to encase or enrobe the individual strips with a substantially continuous batter layer. The batter coated strips are then conveyed to a fryer for parfrying in hot oil, followed by prompt freezing of the parfried strips. In accordance with some preparation processes as described by way of example in copending U.S. Serial No. 09/182,618, which is incorporated by reference herein, the batter coated strips may advantageously be subjected to a second parfry step followed by a second freeze step. In either case, the parfried and frozen batter coated strips are packaged for appropriate storage and/or shipment awaiting finish preparation.

For finish preparation, the frozen batter coated French fry potato strips may be finish fried in hot oil, or alternately finish prepared by other methods such as oven heating. The finish prepared strips exhibit a highly desirable combination of taste and texture characteristics, with the batter coating being substantially transparent or clear. Specifically, the finish prepared strips are golden brown in color, and are characterized by a crispy and crunchy outer surface encasing a light and tender interior. Importantly, the finished strips have an outer surface crispness and a resultant extended holding time comparable to potato strips prepared with other batter coatings as described, for example, in U.S. Patents 5,059,435; 5,141,759; 5,648,110; and 5,750,168. However, the finished strips coated with the improved batter of the present invention further exhibit reduced levels of overall toughness and off flavors. These benefits are achieved in a batter composition which is comparatively less costly.

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One preferred starch based batter of the present invention is set forth
in the following Table 1:

TABLE 1

Ingredients	% of coating	% of slurry	% of potato
Crosslinked Modified Potato Starch	6	2.50	0.49
Crosslinked Modified Tapioca Starch	27	11.26	2.22
Rice Flour (Long)	20	8.34	1.64
Unmodified Corn Starch (Hylon VII)	6	2.50	0.49
Unmodified Corn Starch (Melojel)	6	2.50	0.49
Acetylated, Chemically Modified (Crisp Film) Corn Starch	8	3.34	0.66
Flour Salt	3.75	1.56	0.31
Soda	0.7	0.29	0.06
SAPP 28	1	0.42	0.08
Corn Syrup Solids	0.25	0.10	0.02
Potato Dextrin	4.8	2.00	0.39
Tapioca Dextrin	3.2	1.33	0.26
Pregelatinized Crosslinked Potato Starch (Pen Plus 40)	0.5	0.21	0.04
Xanthan Gum (Keltrol F)	0.12	0.05	0.01
Modified Corn Starch (National Clearcoat Base)	12.68	5.29	1.04
TOTAL DRY INGREDIENTS	100%	41.7%	8.21%

Crosslinked modified potato starch and crosslinked modified tapioca starch are available from Emsland Starke of Emlichheim, Germany. Hylon VII and Melojel are unmodified corn starches and Crisp Film is a modified corn

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starch, all available from National Starch and Chemical Corporation of Bridgewater, New Jersey. An exemplary potato dextrin is Emdex KS 1025, available from Emsland Starke of Emlichheim, Germany. An exemplary tapioca dextrin is National 0280, available from National Starch and Chemical Corporation of Bridgewater, New Jersey, and may optionally be substituted by the use of additional potato dextrin. Pen Plus 40 is a crosslinked potato starch available from Penford Food Ingredients Co. of Englewood, Colorado. Keltrol F is a xanthan gum available from NutraSweet Kelco Co. of San Diego, California. National Clearcoat Base is an acetylated cross-linked regular corn starch (25 - 27% amylose) available from National Starch and Chemical Corporation of Bridgewater, New Jersey.

In an exemplary preparation process using the improved batter as set forth in Table I, elongated so-called shoestring potato strips are cut to a desired size and shape from raw whole peeled and trimmed potatoes, such as Russet Burbank, Shepody, or other potato varieties used commonly in the production of parfried and frozen French fry potato strips. Specifically, these potatoes are cut into strips of generally square cross sectional shape with the width of each cut strip side on the order of about 0.28 - 0.30 inch. The lengths of the cut potato strips vary according to the size of the potatoes being cut, with a typical length ranging from about one inch to about 6 inches.

These shoestring potato strips are partially cooked by water blanching in hot water or steam, such as blanching at approximately 155 - 200°F for about 2 - 15 minutes. In a water blanching step, dextrose and/or sodium acid pyrophosphate (SAPP) may be present in minor amounts for improved browning and color control during subsequent processing. Alternately, after blanching, the strips may be dipped in water containing these constituents. The blanched potato strips are then drained of excess water and/or partially dried in any suitable manner, such as by exposure to heated or warm ambient air for a sufficient time to achieve a strip weight loss on the order of about 15%.

Thereafter, the potato strips are encased or enrobed within the starch based batter applied by dipping or spraying. The dry batter mix set forth in Table 1 is mixed with water to form an aqueous slurry containing approximately 38 - 44% and preferably about 41 - 42% of the dry mix by weight. When coated

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with this batter, the coated strips exhibit an approximate 16 - 22% increase by weight, wherein about 40% of the net weight increase, or about 8% of the total weight of the batter coated strips, is represented by the solids proportion of the starch based batter slurry.

The batter coated strips are next subjected to a parfry step in hot oil for further partial cooking. This parfry step is of relatively short duration, about 20 - 100 seconds, and takes place in hot oil at a temperature of about 350 - 395°F. A vegetable oil, such as a soy-based oil, is preferred. However, it will be recognized and understood that other cooking oils may be used such as animal oil, or combinations of vegetable and animal oils. In this regard, it will be further understood that the cooking oil may comprise any of a wide range of natural and synthetic fats or oils consisting essentially of triglycerides, as well as non-toxic fat-like materials having properties similar to triglycerides and commonly referred to as fat substitutes which may be fully or partly indigestible.

The parfried potato strips are removed from the hot oil and are promptly frozen as by blast freezing in a typical commercial blast freezer at about -15°F. The parfried batter coated potato strips exhibit a moisture content of about 60 - 65% by weight, and a fat content of about 4 - 10% by weight. These parfried and frozen strips may be packaged for storage and/or shipment pending finish preparation for consumption. Alternately, as described in the above-referenced copending U.S. Serial No. 09/182,618, the once-parfried and frozen strips may be subjected without prior thawing to a second parfry step, also of relatively short duration of about 60 - 330 seconds, in hot oil such as a soy-based vegetable oil at a temperature of about 290 - 395°F for further partial cooking, after which the strips are promptly frozen a second time as by blast freezing at about -15°F. The specific duration of the second parfry step generally will be inversely proportional to the specific duration of the first parfry step. The twice-parfried and twice-frozen batter coated potato strips are then packaged in a normal manner for shipment and/or storage in the frozen state, awaiting finish preparation for consumption.

The following Table 2 sets forth specific processing parameters in accordance with one example utilizing the improved batter coating of the present invention:

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TABLE 2

Process Parameter	
Blanch Temperature	175°F
Blanch Time	3.5 min.
Post Blanch Dip Temp.	140°F
Post Blanch Dip — Dextrose	0.3%
Post Blanch Dip — SAPP	0.5%
Post Blanch Dip — Salt	3%
Post Blanch Dip — Time	30 sec.
Post Dip Dry — Temp.	160°F
Post Dip Dry — Weight Loss	15%
Parfry Temperature	375°F
Parfry Time	40 sec.
Post Parfry/Freeze Strip Moisture	62.7%
Post Parfry/Freeze Strip Fat	6.8%
Batter — % Solids	41.7%
Batter — Temperature	59°F
Batter — % Weight Pickup by Strips	18.61%
Batter — % Weight Solids Pickup by Strips	7.8%

The parfried and frozen batter coated potato strips can be finish prepared when desired, for example, by finish frying in hot oil at a temperature of about 320 - 380°F and a time of about 60 - 210 seconds, with a typical temperature of about 350°F and a time of about 165 seconds. The finish prepared strips exhibit a high quality set of overall taste, appearance and texture traits, together with a desirably crispy outer surface which enhances the post-preparation strip holding time. In addition, the finished strips are characterized by a reduced toughness typically associated with batter coated strips, together with a reduction in off flavors typically associated with batter coated strips.

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A variety of modifications and improvements in and to the improved batter coating and the resultant batter coated strips will be apparent to those persons skilled in the art. Accordingly, no limitation on the invention is intended by way of the foregoing description, except as set forth in the appended claims.

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WHAT IS CLAIMED IS:

1. A batter for coating cut vegetable strips such as French fry potato strips suitable for parfrying and freezing, said batter comprising dry ingredients in a proportion by dry weight of about 1 - 12% potato starch, about 20 - 27% tapioca starch, about 20 - 40% corn starch, about 15 - 25% rice flour, and about 4 - 12% dextrin.
2. The batter of claim 1 wherein the dry ingredients are combined in an aqueous slurry and wherein the dry ingredients represent about 38 - 44% by weight of the aqueous slurry.
3. The batter of claim 2 wherein the dry ingredients represent about 41 - 42% by weight of the aqueous slurry.
4. The batter of claim 1 wherein said corn starch comprises modified corn starch in a dry weight proportion of about 15 - 25%, and unmodified corn starch in a dry weight proportion of about 5 - 15%.
5. The batter of claim 1 wherein the dry ingredients are provided in a proportion by dry weight of about 6% potato starch, about 27% tapioca starch, about 20% modified corn starch, about 12% unmodified corn starch, about 20% rice flour, and about 8% dextrin.
6. The batter of claim 5 wherein said dextrin comprises a combination of potato dextrin and tapioca dextrin.
7. A method for preparing cut vegetable strips such as French fry potato strips, comprising the steps of:
 - cutting vegetable products such as potatoes into elongated strips;
 - blanching the strips;
 - coating the strips with an aqueous slurry batter comprising a combination of dry ingredients provided in a proportion by dry weight of about

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1 - 12% potato starch, about 20 - 27% tapioca starch, about 20 - 40% corn starch, about 15 - 25% rice flour, and about 4 - 12% dextrin; parfrying the coated strips; and freezing the parfried coated strips.

8. The method of claim 7 wherein the dry ingredients represent about 38 - 44% by weight of the aqueous slurry batter.

9. The method of claim 8 wherein the dry ingredients represent about 41 - 42% by weight of the aqueous slurry batter.

10. The method of claim 7 wherein the coated strips exhibit a weight increase of about 15 - 25% attributable to the aqueous slurry batter.

11. The method of claim 10 wherein the coated strips exhibit a weight increase of about 8% attributable to the dry ingredients of the aqueous slurry batter.

12. The method of claim 7 wherein said corn starch comprises modified corn starch in a dry weight proportion of the dry ingredients of about 15 - 25%, and unmodified corn starch in a dry weight proportion of the dry ingredients of about 5 - 15%.

13. The method of claim 7 wherein the dry ingredients are provided in a proportion by dry weight of about 6% potato starch, about 27% tapioca starch, about 20% modified corn starch, about 12% unmodified corn starch, about 20% rice flour, and about 8% dextrin.

14. The method of claim 13 wherein said dextrin comprises a combination of potato dextrin and tapioca dextrin.

15. Parfried and frozen potato strips prepared in accordance with the method of claim 7, having a moisture content of about 60 - 65% by weight.

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16. The method of claim 7 further including the step of finish preparing the parfried and frozen strips for consumption.

17. The method of claim 16 wherein said step of finish preparing the strips comprises finish frying.

18. Finish prepared batter coated strips prepared in accordance with the method of claim 16.

19. A batter for coating cut vegetable strips such as French fry potato strips suitable for parfrying and freezing, said batter comprising an aqueous slurry including by weight about 3% potato starch, about 11% tapioca starch, about 14% corn starch, about 8% rice flour, and about 3% dextrin.

20. The batter of claim 1 wherein the total solids proportion of said aqueous slurry is about 38 - 44% by weight.

21. The batter of claim 19 wherein said corn starch comprises a combination of modified and unmodified corn starch.

22. The batter of claim 19 wherein said dextrin comprises a combination of potato dextrin and tapioca dextrin.

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A21D 10/04; A23B 7/16; A23L 1/0522; A23L 1/217
US CL : 426/102, 438, 441, 550, 555, 578, 637, 661

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/102, 438, 441, 550, 555, 578, 637, 661

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,648,110 A (WU ET AL) 15 July 1997 (15-07-97), See entire document.	1-22
Y	US 5,750,168 A (WOERMAN ET AL) 12 May 1998 (12-05-98), See entire document.	1-22
Y,P	US 5,897,898 A (ROGOLS ET AL) 27 April 1999 (27-04-99), See entire document.	1-22
Y,E	US 5,997,918 A (MELVEJ) 07 December 1999 (07-12-99), See entire document.	1-22
Y,E	US 6,022,569 A (ROGOLS ET AL) 08 February 2000 (08-02-2000), See entire document.	1-22
A	US 5,059,435 (SLOAN ET AL) 22 October 1991 (22-10-91).	none

Further documents are listed in the continuation of Box C. See patent family annex.

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